

## Plant Pathology Fact Sheet

# “Emergency” Inoculation for Poorly Nodulated Legumes

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## Introduction

Frequently, stunted and yellowed legumes are thought by growers to be diseased. Close examination often reveals that such “diseased” plants are actually just poorly nodulated.

“Emergency” inoculation refers to the application of inoculant to a crop after it has emerged and begun to show nitrogen deficiency symptoms. A developing crop may need this type of inoculation because no inoculant was used initially, the inoculant or pre-inoculated seed was stored improperly, or soil conditions were too hot and dry, resulting in plants with few or no nodules on the roots. “Emergency” inoculation should not be needed if you use good quality inoculant and employ recommended inoculation methods at the start. However, there are times when something unforeseen does happen and “emergency” inoculation is necessary. “Emergency” inoculation has at best a 50:50 chance of success, but if it works it is much cheaper than completely replanting a field.



HEALTHY, WELL-NODULATED ALFALFA ROOTS (RIGHT) COMPARED TO ROOTS WITH LITTLE TO NO NODULATION (LEFT).

## “Emergency” Inoculation Methods

The types of “emergency” inoculants that can be used to alleviate poor nodulation problems are discussed below. Keep in mind that because the *Rhizobium* bacteria are very sensitive to UV radiation, exposure to sunlight must be minimized. Ideally, these procedures should be applied on a cool, cloudy day, preferably in late afternoon. Rain following the application increases the chances of success.

It is also important to note that the pH of the soil can be a deterrent to nodulation. In this case “emergency” inoculation would not be a solution as long as the pH is also a problem. If the soil pH is below 6.0, some type of lime application should be used to adjust the pH. The application of limestone normally requires 6 months to raise the soil pH, so a well thought-out liming program is necessary for optimum legume growth on acid soils. Make sure the soil pH is not a problem prior to using emergency inoculation.

If you have any questions regarding any of these methods, contact your County Extension agent or a University of Kentucky Extension Agronomist.

**HUMUS-BASED INOCULANT** can be applied in one of three ways:

- The humus inoculant is coated onto sand or a similar coarse material just as it would be coated onto the seed. A sticking agent is used to help the inoculant adhere to the carrier. Approximately 75 pounds of carrier per 1 to 2 pounds of inoculant should be broadcast over 1 acre. One half of the carrier/inoculant combination should be broadcast going in one direction across the field and the other half broadcast in a perpendicular direction. This application method will provide a more uniform coverage with less streaking.
- The humus inoculant is mixed with a carrier such as cottonseed meal. The use of a fibrous feed-based carrier eliminates the need for a sticking agent. Use 40 to 50 pounds of meal as the carrier for 1 to 2 pounds of inoculant. This amount should be broadcast over 1 acre.
- A fine slurry can be prepared and then sprayed over the affected field. One pound of fine humus inoculant should be mixed well in at least 40 gallons of water and sprayed over 1 acre. Higher

water volumes increase the success rate by helping inoculum move into the soil. Normal nozzles can be used, although they should be checked and cleaned more often than usual. If large acreages are to be sprayed, it may be necessary to use nozzles with larger orifices and to agitate the spray tank continuously. It will also help to remove the screens from the nozzles.

**LIQUID BROTH CULTURES** of *Rhizobium* inoculants can be ordered from a number of inoculant companies. Be sure to ask for any specific directions which the company may have for its use. The commercial liquid inoculant should be applied at a rate of 1 gallon per 10 acres. Dilution rates of 1 gallon of commercial inoculant in 10 to 20 gallons of water are recommended, but this may be varied according to the equipment available. Regular nozzles are acceptable as long as good coverage is obtained.

Applications should be made during the cool times of the day and preferably before a rain. Liquid inoculation is a viable alternative to humus inoculation, as long as the liquid inoculant is treated as a living, heat sensitive biological material. Higher water volumes increase the success rate by helping the inoculum move into the soil.

**NO-TILL METHOD.** Some producers have had success improving the nodulation of non-nodulated new seedlings by no-tilling low rates of seed with high rates of inoculum. This technique places new rhizobia directly into the soil so the bacterium is protected from UV radiation.

### **Additional Resources**

The following University of Kentucky publications are available at County Extension offices, as well as on the Internet. Additional information can also be found on

the University of Kentucky Department of Plant and Soil Sciences Forage Web site  
<http://www.uky.edu/Ag/Forage>.

- Alfalfa-The Queen of Forage Crops, ID-76  
<http://www.ca.uky.edu/agc/pubs/agr/agr76/agr76.pdf>
- Establishing Forage Crops (2003)  
<http://www.ca.uky.edu/agc/pubs/agr/agr64/agr64.htm>
- Inoculation of Forage Legumes, AGR-90 (2002)  
<http://www.ca.uky.edu/agc/pubs/agr/agr90/agr90.pdf>

- Liming Acid Soils, AGR-19 (1993)  
<http://www.ca.uky.edu/agc/pubs/agr/agr19/agr19.htm>
- Lime and Nutrient Recommendations (2008-2009)  
<http://www.ca.uky.edu/agc/pubs/agr/agr1/agr1.pdf>

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*Photo courtesy of the University of Kentucky  
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